Harold St. John.

Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 30. July, 1928. No. 355.

EVIDENCE OF THE HYBRID NATURE OF BETULA SANDBERGI

C. O. Rosendahl

(Plate 170)

In a paper published in 1916[1] I called attention to two forms of *Betula* occurring in eastern Minnesota which showed evidence of being natural hybrids between some of the common native species of the region. One of these, already described by Britton[2] as *Betula Sandbergi*, was shown to be almost certainly a hybrid between *B. papyrifera* and *B. pumila* var. *glandulifera*, the other a hybrid between the latter species and *B. lutea*. No name was assigned to this combination as it was thought that it could hardly be identified with *Betula Purpusii* Schneider[3] said to be a hybrid of *B. lutea* × *B. pumila* (not *B. pumila* var. *glandulifera*). However Schneider's *B. Purpusii* was a natural hybrid coming originally from "Clark's Lake," Mich. and typical *B. pumila* now appears not to occur in that state (See below, p. 108), so that Schneider's plant was in truth the hybrid of *B. lutea* × *B. pumila* var. *glandulifera* discussed in my former paper. His very brief description of *B. Purpusii* corresponds well with the Minnesota plant.

During the intervening years since 1916 *B. Sandbergi* has been found in several additional places throughout Hennepin, Ramsey and Anoka Counties and in the summer of 1927 it was collected in

[1] Rosendahl, C. O. Observations on Betula in Minnesota. Minn. Bot. Stud. 4: 443–459, 1916.

[2] Britton, N. L. Four new North American Birches. Bull. Torr. Bot. Club. **21**: 166, 1904.

[3] Schneider, C. K. Ill. Handb. d. Laubholzk. **1**: 102, 1904.

its typical form at two stations in Itasca Park. In the latter case, as in all previous instances of occurrence, both the parent species were present in relative abundance. *B. Purpusii* appears on the contrary to be rather scarce since only two stations have been added to the previous record, one in Ramsey County, the other in southern Pine County.

The assumption that these two birches were of hybrid nature was based on the presence of a number of intermediate characters together with a consistently high percentage of pollen sterility. No other evidence was available but since that time cultural experiments have shown the assumption to be correct in the case of one of the hybrids. In the original publication attention was called to the fact that attempts to grow the seeds of these hybrids were largely unsuccessful, only three seedlings of *B. Sandbergi* having been obtained. Two of these seedlings flourished for a number of years and almost from the beginning showed considerable difference in regard to habit and rate of growth. When about four years old one of them had attained a height of two feet while the other was about twice that size. This difference in rate of growth was nearly maintained until the time of death of the smaller shrub when it had reached a height of about 4½ feet while the other was about 10 feet high. At the present time the latter has produced three stems from the original base which vary in height from 8 to 14 feet. It has essentially the aspect of the parent hybrid, except that the bark is somewhat lighter in color. The leaves of this shrub, however, resemble those of *B. papyrifera* except that they average somewhat smaller in size and have only 5–6 pairs of lateral veins instead of 7–8, the number in *B. papyrifera*. They show the conspicuous tufts of hairs in the axils of the main veins and the doubly serrated margins which characterize most specimens of the latter (text fig. 1, a, b). The fruiting catkins produced this year are slightly longer than in *B. Sandbergi* but the fruiting scales and nutlets are practically identical with the corresponding structures of the parent hybrid. It is interesting to note that all the nutlets examined are without fertile seeds and that the stamens in the catkins for next year contain almost 100% defective pollen.

The smaller one of the two shrubs resembled the local form of the Low Birch in the very slender branches and somewhat strict habit of growth but showed rather mixed leaf characters.

From the accompanying drawings (text fig. 1, c, d, e), made with a camera lucida, it can be seen that in form and size the leaves resemble very closely *B. Sandbergi* but they have the short petioles characteristic of *B. pumila* var. *glandulifera*. Unlike either of these, however, the leaves are permanently pubescent on both surfaces and furthermore the twigs at the end of the season are still quite pubescent.

A portion of the same seed collection from which the above described plants were obtained was sent to Dr. Sargent for cultivation at the Arnold Arboretum. Much better success was had with this lot and a few years later Dr. Sargent sent me five specimens from as many shrubs which are shown in the accompanying illustrations (Plate 170, Fig. 2–6). He also stated that several additional shrubs from the same crop were then (1917) growing in the parks at Rochester, N. Y.

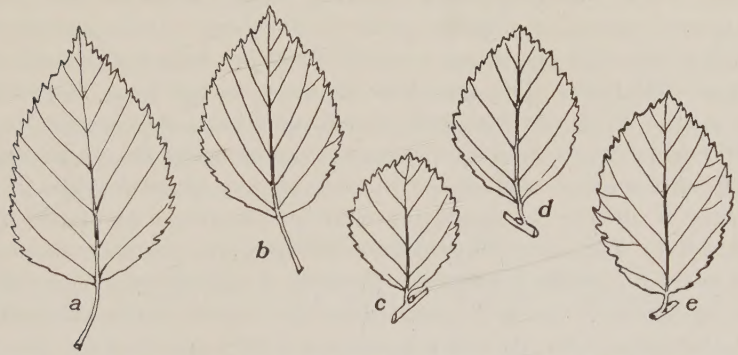

FIG. 1. F_2 segregates of *B. Sandbergi* cultivated at the University of Minnesota (see text).

Figure 1 of the photographic illustration shows a twig of the plant from which the seed was obtained and it represents the typical form of *B. Sandbergi* as it occurs commonly throughout this region. It is designated F_1. Unfortunately there is no definite proof that it is the first generation hybrid but the consistent recurrence of this type in a number of places where the parent species abound would seem to justify the assumption. At any rate it is the seed parent of the plants shown in figures 2–6, Plate 170.

It is fairly obvious that fig. 3 is the only one of the offspring which resembles the parent somewhat closely in leaf-form. The texture, venation and serration are essentially the same and the only perceptible difference is in the smaller size of a number of the leaves, the

average being about 2.5 x 1.5 cm. against 3.5 x 2.8 cm. for the parent. Furthermore there are only 4 pairs of lateral veins to the leaves while the F_1 plants frequently have 5. The young twigs are glandular, finely puberulent, and sparingly pubescent in both. The specimen shown in figure 2 resembles *B. pumila* var. *glandulifera* somewhat closely but with the important exception that the leaves are persistently pubescent on both surfaces, especially along the mid-rib and the main lateral veins. Both leaves and young twigs are abundantly glandular-dotted and the segregation of characters of *B. pumila* var. *glandulifera* is clearly indicated.

In this connection it is worth noting that there are several collections in the University herbarium from different stations in Minnesota which resemble the plant shown in figure 3 very closely both as to form of leaf and pubescence and it is highly probable that they represent natural segregates from *B. Sandbergi.* It is significant that a very high percentage of sterile seeds has been found in all of these collections. The specimens in question had been identified as typical *B. pumila,* but while closely simulating that species they differ in having more slender branches, less orbicular leaves, slightly different serration and in being more or less gland-dotted. The writer is inclined to regard the reported occurrence of typical *B. pumila* in Minnesota, Wisconsin, Michigan and northern Indiana as based on similar segregating forms of *B. Sandbergi.* There are no specimens of typical *B. pumila* from these states in the Minnesota Herbarium and Dr. Butters who recently kindly examined the collections in the Gray Herbarium for me, reports that there also all reputed specimens of typical *B. pumila* from the above noted states appear to be segregates of *B. Sandbergi.*

The specimens illustrated in figures 4, 5 and 6 are clearly of a different type from those in figures 2 and 3. The leaves are distinctly ovate, with cordate or subcordate bases in contrast to the elliptic, rhombic to obovate form and narrowed bases of the others. They are all somewhat gland-dotted on both surfaces, pubescent along the veins and have much longer petioles. The young twigs have conspicuous resinous glands, and are sparingly pubescent.

Although the three specimens show some variation among themselves in regard to form and size of leaf the segregation of *B. papyrifera* characters is nevertheless quite obvious in all three. No opportunity has as yet been offered to check up on the bark, fruiting

catkins, nutlets and pollen of these shrubs in the Arnold Arboretum.

It should be added in conclusion that it has not been possible hitherto to secure any experimental evidence of the hybrid nature of *B. Purpusii* such as presented in the foregoing paragraphs for *B. Sandbergi*. Fruit has been collected from various stations and plantings made under different temperature conditions but no seedlings have been obtained. An examination of numerous nutlets from all the collections available has recently been made and in no cases were they found to contain seed. This, together with the uniform failure to get any germination, indicates a probable complete sterility of the hybrid for the Minnesota region at least. From a comment by Schneider (l. c. p. 102) it can be inferred that a plant in Darmstadt, which he designated as *B. Purpusii* var. *luteoides* was derived from the Michigan hybrid, although it is not expressly stated. If the inference is correct then it follows that the hybrid at least occasionally produces fertile seed and furthermore that segregation also takes place for he adds that the variety is a tree-like shrub resembling *B. lutea* much more closely than the shrubby plant from Clark's Lake which he names var. *typica*.

University of Minnesota.

Explanation of Plate 170.

Fig. 1. *Betula Sandbergi* F_1 from Hennepin County, Minn.; Figs. 2–6 F_2 segregates cultivated at the Arnold Arboretum from seed obtained from plant in Fig. 1 (see text).

AN UNCOMMON ASSOCIATION OF PINES IN NORTHERN NEW YORK

E. W. Littlefield

During the latter part of May, 1925, while engaged in work connected with white pine blister rust control in the town of Chesterfield, Essex County, N. Y., for the New York Conservation Department, I noticed an old field which was growing up to pine. The conspicuous feature here was a dense grove of jack pine (*Pinus Banksiana*, Lamb.) occupying perhaps a tenth of an acre, the trees ranging from four to six inches in diameter and about 25 feet high. Growing in the same field were other groups and individuals of the jack pine, and also of pitch pine (*Pinus rigida*, Mill.), red pine (*P. resinosa*, Ait.) and a very few white pine (*P. Strobus*, L.). The

reproduction on this area was a curious mixture, composed principally of *P. Banksiana* and *P. rigida* in considerable abundance. The former species appeared on the whole to be the more aggressive, occasionally even surrounding a pitch pine seed tree, to the detriment of the latter's offspring. Counts taken later on a few sample milacres indicated the density of the reproduction to be as high as six or seven thousand trees per acre in places, with a general average of probably two or three thousand. About 8 acres were covered by this formation, which was highly variable, with all degrees of stocking, mixture and age classes. To the west, the pitch pine and red pine became increasingly dominant, with an open stand of almost pure red pine in the extreme west end.

This field occupies about 50 acres of a sandy bench on the south side of the Ausable River opposite the village of Clintonville, at the top of a steep highway ascent from the river known as "Clintonville Hill." The present owner, Mr. J. McAuliffe, states that the land has not been mowed for at least 30 years, but has been almost constantly pastured, at times heavily, by cattle and horses.

The intimate association here of *Pinus Banksiana* and *P. rigida* was of considerable interest to me, as I had not seen anything similar before, nor have I since, except for a few less striking examples in the same locality. Although the ranges of these two species overlap to a considerable extent, they are not commonly thought of as associates. It is true that they are to be found in the same locality on Mt. Desert Island, Me.; both, according to Rand[1] occur there on Green Mtn., but in different situations. In northern Maine, for the most part, *Pinus Banksiana* is reported from various scattered stations north of the range of *Pinus rigida*. In New Hampshire, curiously enough, isolated individuals of the latter species have been found at Shelburne[2] some 40 miles north of some equally isolated specimens of jack pine in the town of Thornton.[3] In the Champlain Valley, *Pinus rigida* is abundant on both sides of the lake, occurring near the shore and for some distance up the courses of rivers emptying into the lake. *Pinus Banksiana*, on the other hand, while rare in Vermont,[4] is found more frequently on the New York[5] side, partic-

[1] Rand: Rhodora I. (1899) p. 135.
[2] Deane: Rhodora XI. (1909) p. 21.
Ibid. XII. (1910) p. 99.
[3] Bull. Torrey Bot. Club XVIII. (1891) p. 150.
[4] Clark: Trees of Vermont. Bull. Vt. Agr. Expt. Sta. 73 (1899).
[5] N. Y. State Mus. Vol. V. No. 25 (1898) Rept. State Botanist.

ularly in the Ausable Valley, where it is quite common. According to the writer's own observations, it is to be met with frequently from the vicinity of Clintonville, mentioned above, as far as Upper Jay, a distance along the river of about 15 miles; pitch pine is abundant up to Ausable Forks, 5 miles above Clintonville, but practically disappears between there and Lower Jay. The meeting ground of the two species is thus restricted essentially to a five or ten mile reach along the valley. Even in this section, the species are ordinarily not found together in any abundance on the same site, leading further to the conclusion that the condition described on the Clintonville area is a rather uncommon occurrence.

(The writer is indebted to the late Geo. B. Sudworth of the U. S. Forest Service for some correspondence on the subject, and to the Arnold Arboretum for access to the library and herbarium.)

Conservation Department, Albany, New York.

RORIPA ISLANDICA AND R. HISPIDA

M. L. Fernald

While looking over with Brother Victorin his collection of 1927 from Anticosti I was impressed with the unusual appearance of the material which he had labeled *Roripa palustris* (L.) Bess. The Anticosti plant differed at once from the common American plant which we generally know as *R. palustris* in its more delicate texture and in its uniformly pinnate or deeply pinnatifid leaves, much as in *R. sylvestris* (L.) Bess.; the common American plant being coarser and stiffer, with heavier foliage, the lower leaves merely somewhat pinnatifid or runcinate at base, the upper coarsely toothed to subentire. The latter plant is common across North America and extends into eastern Asia and in America is passing as *R. palustris* (glabrous and with pods usually ellipsoid) and var. *hispida* (Desv.) Rydb. (more or less hirsute and with pods tending to be subglobose). A few sheets from eastern America match the Anticosti plant and upon comparison are found to be unquestionably the European *R. palustris*. Whether this plant is native in eastern America is doubtful, for several of the specimens come from ballast-lands or from ports or roadsides; but others are from river-banks or other natural habitats.

The combination *Roripa palustris* proves, however, not to carry the

oldest specific name for this European species. Although starting with Linnaeus as *Sisymbrium amphibium*, α. *palustre* and δ. *terrestre* and taken up by later authors as *Sisymbrium palustre* Pollich (1777), *S. terrestre* With. (1796), *Nasturtium terrestre* R. Br. (1812), *N. palustre* DC. (1821) and likewise under *Roripa* and *Radicula*, the European plant had its first *specific* name in *Sisymbrium islandicum* Oeder (1768).

Whether our coarser plant is specifically or only varietally separable from *Roripa islandica* (Oeder) Schinz & Thell. may be debatable; but it is certainly as strong a species as many in this group which are universally recognized. Consequently, until we have evidence to the contrary, it may be treated as an American and eastern Asiatic species, for which the first published specific name was *Brachilobus hispidus* Desv. (1814), this name being given to the hirsute plant which we have been calling *Roripa palustris*, var. *hispida*.

The bibliography of the two seems to be as follows:

Roripa islandica (Oeder) Schinz & Thellung, Viertelj. Naturf. Ges. Zürich, liii. 538 (1908). *Sisymbrium amphibium*, α *palustre* and δ *terrestre* L. Sp. Pl. ii. 657 (1753). *Sisymbrium islandicum* Oeder, Fl. Dan. iii. fasc. 7: 8, t. ccccix (1768). *S. amphibium* Mill. Gard. Dict. ed. 8, no. 3 (1768), not L. *S. palustre* (L.) Pollich, Hist. Pl. Palat. ii. 230 (1777), not Garsault (1764). *Radicula palustris* (L.) Moench. Meth. 263 (1794). *S. terrestre* (L.) With. Bot. Arr. Brit. Pl. ed. 3: iii. 582 (1796). *Nasturtium terrestre* (L.) R. Br. in Ait. Hort. Kew. ed. 2, iv. 110 (1812). *N. palustre* (L.) DC. Syst. ii. 191 (1821), not Crantz (1769). *Roripa palustris* (L.) Bess. Enum. Pl. Volhyn. 27 (1822).—Eurasia: the following American specimens have been seen. Quebec: along railway, 20 miles inland, Anticosti Island, 1917, *Victorin*, no. 4136; dépressions humides dans la platière de l'estuaire, Rivière McKane, Anticosti, *Victorin & Rolland*, no. 27,265. Nova Scotia: on ballast, North Sydney, 1883, *J. Macoun;* river flat [near railroad yard], Truro, 1920, *Bissell, Bean, White & Linder*, no. 21,326. New Hampshire: river-beach, Hanover, 1910, *E. F. Williams*. Massachusetts: Somerville [in metropolitan area], 1878, *C. E. Perkins;* in dry gravel, railroad track, North Cambridge, 1896, *B. L. Robinson;* dry open roadside, Worthington, 1912, *Robinson*, no. 801. Connecticut: Lakeville, 1902, *O. P. Phelps*. New York: Penn Yan, *Sartwell*.[1] New Jersey: ballast ground, Camden, 1885, *C. A. Gross*.

[1] Upon Sartwell's label Gray made the manuscript note: "Vera, cf. adn. in Pl. Fendl." In the latter work, in 1849, Gray made the comment, under *Nasturtium palustre:* "The only *characteristic* North American specimens of N. palustre which I possess were collected by Dr. Sartwell in Western New York."—Gray, Pl. Fendl. 6 (1849).

Roripa hispida (Desv.) Britton, Mem. Torr. Bot. Cl. v. 169 (1894). *Brachilobus hispidus* Desv. Journ. Bot. iii. 183 (1814). *Sisymbrium hispidum* (Desv.) Poir. Encyc. Suppl. v. 161 (1817). *Nasturtium hispidum* (Desv.) DC. Syst. ii. 201 (1821). *N. palustre*, var. *hispidum* (Desv.) Gray, Man. ed. 2: 30 (1856). *Roripa palustris hispida* (Desv.) Rydb. Bot. Surv. Neb. iii. 26 (1894) and Contrib. U. S. Nat. Herb. iii. 149 (1895). *Radicula hispida* (Desv.) Britton, Torreya vi. 30 (1906). *Rad. palustris*, var. *hispida* (Desv.) Robinson, Rhodora, x. 32 (1908).—Widely ranging in North America.

R. hispida, var. glabrata Lunell, Bull. Leeds Herb. no. 2: 6 (1908). *Nasturtium terrestre* of Am. auth., not R. Br. *N. palustre* Am. auth., not DC. *Radicula palustris* Am. auth., not Moench. *Roripa palustris* Am. auth., not Bess.—Widely distributed in North America; Japan.

Gray Herbarium.

A NOTE ON THE GENUS PASPALUM IN NEW ENGLAND

C. A. Weatherby

In the course of continued work on the series of "Preliminary Lists of New England Plants," it has been necessary to examine with some care the species of *Paspalum* found there. The result is the following note, which is published by way of explanation of the classification to be used in the next list and in the hope that it may prove otherwise useful.

There is no New England plant known to me which answers at all obviously to the description of *Paspalum setaceum* in Gray's Manual, "spikelets glandular-spotted and pubescent." There is, however, a slender, small-spikeleted plant known from Nantucket (according to Bicknell), from two stations in Rhode Island and four in Connecticut, in which close examination under a good lens reveals a bit of minute pubescence near the apex of the second glume, at least in a young flower.[1] Under a 40 × binocular, the hairs composing this pubescence are seen to be tipped with tiny glands. Specimens precisely similar have been seen from New Jersey, eastern Pennsylvania, Maryland, and Virginia. Specimens otherwise like them from farther south have glandular-spotted and densely pubescent spikelets. From this southern phase the Manual description was no doubt drawn; but (as Mrs. Agnes Chase very kindly informs me)

[1] The glume is hardly ciliolate, as described by Bicknell (Bull. Torr. Bot. Club xxxv. 182 (1908)); the binocular shows that the hairs are set definitely back from the margin.

Michaux's type, though said to be from "Carolina inferior," is of the glabrate-flowered northern form. And it is so described—"glumis . . . glabris." The name *P. setaceum* is therefore applied to the New England plant with entire correctness.

Of course, nearly all the specimens labelled *P. setaceum* in the older herbaria belong to the species next to be discussed; and a good many recently so determined are merely forms of that species with the spikelets slightly smaller than usual.

I am quite unable to distinguish between the New England plants determined in herbaria as *P. pubescens* and *P. Muhlenbergii*. The principal differentiating character given in the Manual for the former, "culms hirsute below the racemes," surely cannot, by itself, furnish adequate ground for specific separation; and it quite fails to correlate with anything else. There is, indeed, a plant, well represented by specimens collected at Hartford, Conn., by Bissell, Woodward, and Weatherby (no. 2796, Sept. 25, 1909) in which a more or less pubescent culm is associated with leaves more narrowly linear (30–45 times as long as wide) than is usual in this group. But, in New England, at least, one is quite as likely to find narrow leaves associated with glabrous as with pubescent culms; and the same lack of uniformity is present in broad-leaved specimens. Glabrous basal sheaths, a third character adduced by Nash, I have seen in no New England material. Certain specimens from farther south, which were studied by Nash for the North American Flora and which I have had the privilege of examining at the New York Botanical Garden, do indeed have them, and combined with narrow leaves and pubescent culms; but in the New York material, as in that I have seen elsewhere, there is every gradation between this extreme and that with pubescent sheaths, broad leaves and glabrous culms which Nash called *P. Muhlenbergii*. It appears necessary to unite the two under one species; and since *P. pubescens* is by far the earlier name and was (again according to information courteously furnished by Mrs. Chase) correctly interpreted by Nash, it must be used for the resultant group.[1]

Careful comparison shows no difference whatever between the two Connecticut plants reported (in Bull. Conn. State Geol. and Nat. Hist. Survey xiv. 50 (1910)) as *P. plenipilum* and *P. circulare;*

[1] Unless, indeed, Professors Wiegand and Eames are right in their further reduction of the whole to *P. ciliatifolium* Michx. (Cornell Univ. Agric. Exp. Sta. Mem. xcii. 83 (1925)). I am not yet prepared to follow them quite so far.

both are good *P. circulare*. Mr. R. W. Woodward, who collected both, writes to me as follows in answer to an inquiry. "I have never been able to find any difference between the reported *Paspalum plenipilum* and *P. circulare*. I recollect distinctly that the Orange plants were handed over to Mr. Bissell, who in turn referred them to a Paspalum expert . . . The latter named them *P. plenipilum*, Mr. Bissell accepted the determination and so reported it." Evidently the identification of the "Paspalum expert" (whose identity is not now remembered) was taken without question and, in spite of Mr. Woodward's well-grounded doubts, the fact that it was erroneous was not detected in compiling the Connecticut Bulletin and apparently has escaped notice until now. *P. plenipilum* should be excluded from the New England flora.

P. psammophilum is ordinarily a well-marked species. I have seen only a single specimen (Fernald and Long, no. 17889, from Chatham, Mass., Aug. 14, 1919) in which any mixture of characters appears. In it, the leaves are villous, as in *P. pubescens*, but the spikelets pubescent.

We have, then, in New England, three clearly marked and essentially homogeneous species and a fourth, the commonest and most wide-ranging of all, set off cleanly enough from the other three, but within itself subject to considerable fluctuations, so erratic that it seems useless to attempt to organize them into varieties. The four, as here understood, may be keyed out as follows.

A. Sterile lemmas coriaceous, obscurely or not at all nerved; spikelets 1.5–2 mm. long; leaves more or less papillate-ciliate, at least toward the base. B.
  B. Spikelets about 1.5 mm. long, on hispidulous pedicels; second glume with a few minute, deciduous, glandular hairs toward the apex; leaves villous. . . . . *P. setaceum*
  B. Spikelets about 2 mm. long. C.
    C. Spikelets glabrous, on merely scaberulous pedicels; leaves and sheaths villous. . . . . *P. pubescens*
    C. Spikelets glandular-pubescent, on hispidulous pedicels; leaves and sheaths with close, soft pubescence. . *P. psammophilum*
A. Sterile lemmas of comparatively thin texture, with prominent central and marginal nerves; spikelets about 3 mm. long; leaves not ciliate. . . . . *P. circulare*

Gray Herbarium.

Additions to the Flora of Cape Cod.—It may be of interest to record the following plants, apparently new to Cape Cod, which were collected by the writer in 1926: *Lycopodium clavatum*, on a moist

roadside bank close by Wakeby Pond in Sandwich [accompanied by several species rare on Cape Cod but characteristic of rich woodlands of the interior of New England, namely *Polystichum acrostichoides*, *Thelypteris Phegopteris*, *Polypodium virginianum* and *Lycopodium lucidulum*]; *Aster nemoralis*, in a bog at East Falmouth; *Rynchospora inundata*, from a small muddy pond east of John Pond in Mashpee (the only other Massachusetts stations are in Plymouth County); *Najas guadalupensis*, from Oyster Pond and Salt Pond in Falmouth (known from Martha's Vineyard but not hitherto from the mainland of Massachusetts); a form of *Sericocarpus asteroides* with conspicuously reddish rays. This may be designated as

Sericocarpus asteroides (L.) BSP., forma **roseus** n. f., ligulis roseis.—Massachusetts: in sandy soil, Falmouth (type in Gray Herb.), Sept. 1, 1926.—H. K. Svenson, Harvard University.

Betula Sandbergi

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